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Naturally Raised Marketing Claim  
U.S. Department of Agriculture—Agricultural Marketing Service  
Room 2607-S  
1400 Independence Ave., S.W.  
Washington, DC 20250-0254  
*Submitted electronically to [naturallyraised@usda.gov](mailto:naturallyraised@usda.gov)*

## RE: Naturally Raised Marketing Claim

The Humane Society of the United States (HSUS), the nation's largest animal protection organization representing nearly 10 million members and constituents, welcomes the opportunity to submit comments to the U.S. Department of Agriculture's Agricultural Marketing Service regarding the "naturally raised" marketing claim for animal food products.

The "naturally raised" claim offers an alternative to producers and consumers who prefer a method of food production that is more sustainable and less inhumane than practices employed by customary animal agribusiness industries. In order to benefit from the use of this label and the higher prices consumers will likely pay for items labeled "naturally raised," producers must be required to engage in production methods that are meaningfully distinguished from those employed in conventional animal agribusiness and, in fact, are "natural" both in practice and for the animals.

Critical issues include the following:

### Providing natural housing and enriched environmental conditions

Unlike conventionally raised farm animals, those who are sold under the "naturally raised" label must be afforded housing and environmental conditions that recreate the conditions that are actually natural to these animals' species.

Clearly, USDA standards for this label must prohibit intensive confinement practices, including the use of battery cages for egg-laying hens, crates for and tethering of calves raised for veal, and gestation crates for pregnant sows. As well, animals must be raised outdoors, with exceptions for inclement weather and health concerns specific to individual animals, in appropriate environments for each species allowing the animals to satisfy their natural behaviors. For protection, poultry must be brought indoors nightly. Indoor housing for all species must allow for natural daylight, environmental enrichment, adequate space for exercise, and the means to engage in all natural habits. Both indoors and outdoors, animals must be provided with bedding, nesting, and foraging materials appropriate to each species.

### Decelerating unnaturally rapid growth of birds

The overwhelming majority of birds raised for meat are genetically manipulated to grow at such astronomical rates<sup>1</sup> that modern broiler chickens reach market weight in nearly half the time it took chickens in the 1950s,<sup>2,3</sup> while consuming one-third as much feed. Eighty-five to 90 percent of these significant reductions in time and feed intake is due to genetics, and 10 to 15 percent is

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due to nutritional changes.<sup>4</sup> Similarly, in the 1960s, it took 220 days to raise a 35-pound turkey; in

2004, it took only 132 days.<sup>5</sup> Such forced rapid growth results in birds whose bodies “are on the verge of structural collapse.”<sup>6</sup> This emphasis on rapid growth has severely reduced the health and well-being of these birds, causing significant percentages to experience leg disorders,<sup>7,8</sup> skeletal<sup>9,10</sup> and cardiovascular disease,<sup>11</sup> and other painful disabilities.

Specifically, the bone growth of broiler chickens is outpaced by the growth of their muscles and fat, leading to a number of skeletal disorders, including “twisted leg” and tibial dyschondroplasia (TD).<sup>12</sup> “Twisted leg” (valgus-varus or angular bone deformity) is characterized by bowed or knock-kneed legs. The deformity typically starts before ten days of age and, as weight accumulates on the legs, can cause birds to experience spontaneous fractures.<sup>13</sup> TD is characterized by an abnormal mass of cartilage preventing normal bone development, which leads to bone fragility, distortions, and infections. One review concluded that “TD can produce mild or severe chronic pain, or acute severe debility. Lameness caused by TD is a significant welfare concern.”<sup>14</sup> One post-mortem study estimated 30 to 49 percent of broilers examined suffered from TD.<sup>15</sup> Susceptibility is largely genetic. Modern broiler strains experience 40 times the incidence than slower-growing broiler strains suffered in the 1950s, when housed in identical conditions.<sup>16</sup> These skeletal diseases manifest themselves as gait abnormalities. Welfare scientists from both the United States and the United Kingdom have reported a range of unacceptably high rates of leg disorders: Two different surveys have found 27 percent<sup>17</sup> and 90 percent<sup>18</sup> of broiler chickens demonstrate abnormal gait characteristic of leg disorders, while a third found that 30 to 49 percent of broilers suffered from leg deformities.<sup>19</sup>

At six weeks, broiler chickens have such difficulty supporting their abnormally heavy bodies that they spend 76 to 86 percent of their time lying down.<sup>20</sup> Combined with poor litter condition inside grower houses on broiler factory farms, the immobility of the birds leads to increased incidence of painful contact dermatitis—breast blisters, hock burns, and foot pad lesions<sup>21</sup>—which has been found to affect up to 20 percent of broiler chickens.<sup>22</sup> Sheds are not cleared of litter and excrement until chickens are taken to slaughter and, typically, not even after each flock depopulation, meaning the birds have no choice but to stand in their own waste. As a result, bacteria often infect skin sores, leading to disease.<sup>23</sup>

Severe leg deformities also reduce the time broiler chickens spend engaging in such normal behaviors as feeding, drinking, walking, scratching, pecking, and dust-bathing.<sup>24</sup> The systematic frustration of being denied these natural behaviors is believed to cause poor welfare in itself, but can also be fatal in extreme cases where birds can no longer reach food or water.<sup>25</sup> In one study, 1 to 2 percent of broilers died from leg problems.<sup>26</sup> One group of researchers concluded, “We consider that birds might have been bred to grow so fast that they are on the verge of structural collapse.”<sup>27</sup>

Selection for fast growth causes broiler chickens to suffer increased rates of a variety of other diseases, including respiratory infections, coccidiosis (a parasitic infection resulting in sometime fatal blood loss), inclusion body hepatitis (an acute disease associated with anemia and hemorrhagic disorders), deep pectoral myopathy (disease of the muscle or muscle tissue causing degeneration, necrosis, and fibrosis of the deep pectoral muscle), fatty liver and kidney syndrome, hypoglycemia, and acute death syndrome (ADS).<sup>28,29</sup> In ADS, chickens suddenly lose their balance, violently flap their wings, go into spasms, and die of acute heart failure caused by fatal arrhythmias. Between 1 and 4 percent of broilers may die of ADS.<sup>30</sup> Broilers selected for fast growth also suffer from weakened immune systems, making them more susceptible to a variety of infectious diseases.<sup>31</sup>

Ascites, another typical condition among broilers, is characterized by hypertrophy and dilation of the heart, changes in liver function, pulmonary insufficiency, hypoxemia, and the accumulation of fluid in the abdominal cavity.<sup>32,33</sup> Ascites is responsible for 5 to 12 percent of mortality in broiler chickens.<sup>34</sup> While ADS occurs instantly, “ascites develops gradually, the birds suffer for an extended period before they

die.”<sup>35</sup> The problem is largely genetic in origin and requires a genetic solution: “[I]n order to attain the goal of an ascites-free broiler, an acceptable and effective selection program must first be developed and then implemented by the poultry breeding companies.”<sup>36</sup>

One scientific review concluded that “there is no doubt that commercial broilers today are showing higher mortality and higher susceptibility to suboptimal management of nutrition and environment than broilers that have been selected less extremely for efficiency and meat yield.”<sup>37</sup>

Forced rapid growth in turkeys, coupled with the unnatural living conditions customary on industrialized animal factory farms, cause the birds to suffer severe welfare assaults. One study found that between 7 and 28 percent of turkeys suffered hip lesions, while 17 to 83 percent exhibited abnormal gait.<sup>38</sup> Another study found that incidence of tibial dyschondroplasia was as high as 73 percent in turkey flocks.<sup>39</sup> Mortality due to skeletal disease has ranged from 2.7 to 4 percent.<sup>40</sup> According to a 1991 report published in industry journal *Feedstuffs*, “[T]urkeys have been bred to grow faster and heavier but their skeletons haven’t kept pace, which causes ‘cowboy legs.’ Commonly, the turkeys have problems standing...and fall and are trampled on or seek refuge under feeders, leading to bruises and downgradings as well as culled or killed birds.”<sup>41</sup>

Leg disorders cause turkeys, like broilers, to spend much of their time lying down, contributing to painful contact dermatitis—foot-pad lesions, enlarged sternal bursa (“breast blisters”), focal ulcerative dermatitis (“breast buttons”), and hock burns.<sup>42</sup> One study found that 98 percent of turkeys in commercial conditions suffered foot-pad lesions,<sup>43</sup> while another found 67 percent of turkeys suffered breast buttons.<sup>44</sup> These lesions become pathways to bacterial infections.<sup>45</sup>

Rapid growth in turkeys can cause other welfare problems, as well: lowered immune performance, making turkeys more susceptible to a variety of infections;<sup>46</sup> increased rates of the muscle disease focal myopathy;<sup>47</sup> and increased rates of ascites, perirenal hemorrhage syndrome, cardiomyopathy (“round heart” disease), and aortic rupture, with mortality rates as high as 10 percent.<sup>48,49,50</sup>

Producers who benefit from use of the “naturally raised” label must be required to rear slower growing breeds of birds, similar to the “Label Rouge” chickens in France, who comprise the majority of broiler chickens raised in that country.<sup>51</sup> In the United States, several slow-growing breeds are available, but their market share is limited.<sup>52</sup> Nevertheless, selectively breeding birds for such rapid growth that high percentages of them suffer from painfully debilitating diseases would not be considered “natural” by reasonable consumers. To use the “naturally raised” label on poultry products, the animals must not be unnaturally fast-growing breeds.

### **Prohibiting unnatural rates of lay for egg-laying hens**

In the United States during 2004, 76.2 billion table eggs were produced by approximately 300 million hens, each laying an annual average of 260 eggs<sup>53</sup>—a nearly ten-fold increase from the approximately 25 eggs laid each year by their ancestors, Red Junglefowl,<sup>54</sup> and more than double the average 100 eggs laid annually by hens in the 1940s.<sup>55</sup>

A recent review estimated that between 80 and 89 percent of commercial egg-laying hens suffer from osteoporosis,<sup>56</sup> a disease characterized by low bone volume. Osteoporosis is not in itself painful, but it is the principal cause of bone fractures in laying hens and can cause both acute and chronic pain.<sup>57</sup> One study found that 29 percent of battery-caged hens had one or more broken bones by the time they were shackled for slaughter. Remarkably, 98 percent of these birds’ carcasses had broken bones by the time they reached the end of the evisceration line.<sup>58</sup> Another study found that 10 percent of hens had one or

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more broken bones by end-of-lay, while an additional 17 percent experienced fractures during depopulation, transport, and shackling.<sup>59</sup> Fractures of the spine, which can cause paralysis and death, are also reported.<sup>60</sup>

Housing systems and forced physical inactivity influence rates of osteoporosis and fracture. However, the problem is largely genetic in origin, a result of intensive selection for laying hen strains able to maintain long periods of continuous egg production.<sup>61</sup> Indeed, as noted above, average annual egg production per laying hen has increased significantly—from 100 eggs in the 1940s to 260 in 2004. This rate of egg production requires considerable amounts of calcium for eggshell formation. At peak egg production over a sustained period, a hen cannot absorb enough calcium from her diet and draws calcium from bone mass. Over a laying year, the amount of calcium that hens deposit in their shells can be up to 20 times the amount retained in their bodies.<sup>62</sup> One review of osteoporosis in laying hens concluded, “Our information would suggest that the problem is largely genetic in origin, resulting from the breeding of light weight, energetically efficient birds that remain in a high rate of lay for a prolonged period. Continuous loss of structural bone over the laying period results in weak bones.”<sup>63</sup>

For the same reason that birds who have been genetically manipulated to grow at unnaturally rapid rates should not be labeled “naturally raised,” eggs from birds who have been manipulated for astronomical rates of lay should not be labeled “naturally raised.”

### **Prohibiting premature weaning of piglets and calves**

In conventional animal agribusiness, piglets<sup>64</sup> and calves<sup>65,66</sup> are weaned prematurely in order to put these animals into production. Producers benefiting from the “naturally raised” label must be required to comport with a more biologically natural timeframe for these animals. At a minimum, piglets should not be weaned until they are 12 to 15 weeks of age<sup>67</sup> and calves should not be weaned before 8 weeks of age,<sup>68</sup> though some authorities argue that calves should not be weaned until they are between 6 and 9 months old.<sup>69</sup>

### **Prohibiting physical alterations**

Conventionally raised farm animals are typically subjected to a number of painful and unnatural physical alterations, all of which should be prohibited under USDA standards for the “naturally raised” label. Prohibited mutilations include branding, dehorning, tail docking, castration, beak trimming, de-toeing, de-snooding, and dubbing. If any alterations are permitted under this labeling scheme, anesthesia and analgesics must be required.

### **Providing a natural and satisfying diet**

Conventionally raised farm animals are fed diets that may include slaughter by-products, drugs, and animal waste,<sup>70</sup> as well as be overfed or underfed. In contrast, animals who will be marketed under the “naturally raised” label must be provided diets that meet their biological needs, do not threaten their health or compromise their welfare, and do not result in overfeeding or chronic hunger. Examples of practices that must not be allowed under the “naturally raised” label include forced molting of egg-laying hens either through starvation or low-nutrient diets, force-feeding of ducks and geese in foie gras production, and underfeeding of broiler and turkey breeders. Ruminants must be required to receive the majority of their diet on pasture. In addition to banning the use of slaughter by-products and animal waste, standards for the “naturally raised” label should prohibit the non-therapeutic use of antibiotics and other drugs, as well as the use of hormones, such as recombinant bovine growth hormone (rBGH), to increase production.

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Again, I thank you for this opportunity and look forward to submitting further comments to the Agricultural Marketing Service as it continues to develop standards for a “naturally raised” marketing claim.

Sincerely,



Miyun Park  
Vice President, Farm Animal Welfare

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- <sup>1</sup> Duncan IJH. 2004. Welfare problems of poultry. In: Benson GJ and Rollin BE (eds.), *The Well-Being of Farm Animals: Challenges and Solutions* (Ames, Iowa: Blackwell, p. 310).
- <sup>2</sup> Duncan IJH. 2001. Welfare problems of meat-type chickens. *Farmed Animal Well-Being Conference at the University of California-Davis*, June 28-29.
- <sup>3</sup> Personal correspondence with Stephen Pretanik, director of Science and Technology, National Chicken Council, Washington, D.C., January 14, 2004.
- <sup>4</sup> Havenstein GB, Ferket PR, and Qureshi MA. 2003. Growth, livability, and feed conversion of 1957 versus 2001 broilers when fed representative 1957 and 2001 broiler diets. *Poultry Science* 82:1500-8.
- <sup>5</sup> Ferket PS. 2004. Tom weights up seven percent. *WATT PoultryUSA* July:32-42.
- <sup>6</sup> Wise D and Jennings A. 1972. Dyschondroplasia in domestic poultry. *Veterinary Record* 91:285-6.
- <sup>7</sup> Kestin SC, Knowles TG, Tinch AE, and Gregory NG. 1992. Prevalence of leg weakness in broiler chickens and its relationship with genotype. *Veterinary Record* 131:190-4.
- <sup>8</sup> Wyers M, Cherel Y, and Plassiart G. 1991. Late clinical expression of lameness related to associated osteomyelitis and tibial dyschondroplasia in male breeding turkeys. *Avian Diseases* 35(2):408-14.
- <sup>9</sup> Kestin SC, Knowles TG, Tinch AE, and Gregory NG, op cit.
- <sup>10</sup> Martrenchar A. 1999. Animal welfare and intensive production of turkey broilers. *World's Poultry Science Journal* 55(2):143-52.
- <sup>11</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, and Grommers FJ. 1998. Undesirable side effects of selection for high production efficiency in farm animals: a review. *Livestock Production Science* 56:15-33.
- <sup>12</sup> To date, the most extensive review of skeletal problems in broilers is: Bradshaw RH, Kirkden RD, and Broom DM. 2002. A review of the aetiology and pathology of leg weakness in broilers in relation to welfare. *Avian and Poultry Biology Reviews* 13(2):45-103.
- <sup>13</sup> Julian RJ. 2004. Evaluating the impact of metabolic disorders on the welfare of broilers. In: Weeks CA and Butterworth A (eds.), *Measuring and Auditing Broiler Welfare* (Cambridge MA: CABI Publishing, pp. 51-9).
- <sup>14</sup> Julian RJ, Evaluating the impact of metabolic disorders on the welfare of broilers, op. cit.
- <sup>15</sup> Tablante NL, Estevez I, and Russek-Cohen E. 2003. Effect of perches and stocking density on tibial dyschondroplasia and bone mineralization as measured by bone ash in broiler chickens. *Journal of Applied Poultry Research* 12:53-9.
- <sup>16</sup> Havenstein GB, Ferket PR, and Qureshi MA, op. cit.
- <sup>17</sup> Grandin T. 2005. Poultry slaughter plant audit: critical control points for bird welfare. August. [grandin.com/poultry.audit.html](http://grandin.com/poultry.audit.html).
- <sup>18</sup> Kestin SC, Knowles TG, Tinch AE, and Gregory NG, op cit.
- <sup>19</sup> Tablante NL, Estevez I, and Russek-Cohen E, op. cit.
- <sup>20</sup> Weeks CA, Danbury TD, Davies HC, Hunt P, and Kestin SC. 2000. The behaviour of broiler chickens and its modification by lameness. *Applied Animal Behaviour Science* 67:111-25.
- <sup>21</sup> Estevez I. 2002. Poultry welfare issues. *Poultry Digest Online* 3(2):1-12.
- <sup>22</sup> Gregory NG. 1998. *Animal Welfare and Meat Science* (Oxon, U.K.: CABI Publishing).
- <sup>23</sup> Calnek BW, Barnes HJ, Beard CW, McDougald LR, and Saif YM (eds.). 1991. *Diseases of Poultry*, 9th Edition (Ames, Iowa: Iowa State University Press, pp. 293-9).
- <sup>24</sup> Bradshaw RH, Kirkden RD, and Broom DM, op. cit.

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- <sup>25</sup> Sørensen P, Su G, and Kestin SC. 1999. The effect of photoperiod: scotoperiod on leg weakness in broiler chickens. *Poultry Science* 78:336-42.
- <sup>26</sup> Riddell C and Springer R. 1984. An epizootiological study of acute death syndrome and leg weakness in broiler chickens in western Canada. *Avian Diseases* 29:90-102.
- <sup>27</sup> Wise D and Jennings A. 1972. Dyschondroplasia in domestic poultry. *The Veterinary Record* 91:285-6.
- <sup>28</sup> Bartlett B. 1988. Performance problems in growing broilers. *Poultry Digest* 17.
- <sup>29</sup> Julian RJ, Evaluating the impact of metabolic disorders on the welfare of broilers, op. cit.
- <sup>30</sup> Riddell C and Springer R, op. cit.
- <sup>31</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, and Grommers FJ, op. cit.
- <sup>32</sup> Julian RJ, Rapid growth problems: ascites and skeletal deformities in broilers, op. cit.
- <sup>33</sup> Bessei W. 2005. Welfare of meat producing poultry: an overview. In: *Proceedings of the 7th European Symposium on Poultry Welfare* (Lublin, Poland: June 15-19).
- <sup>34</sup> Duncan IJH, Welfare problems of meat-type chickens, op. cit.
- <sup>35</sup> Bessei W, op. cit.
- <sup>36</sup> Balog JM. 2003. Ascites syndrome in broiler chickens. *Avian and Poultry Biology Reviews* 14(3):99-126.
- <sup>37</sup> Arthur JA and Albers GAA. 2003. Industrial perspective on problems and issues associated with poultry breeding. In: Muir WM and Aggrey SE (eds.), *Poultry Genetics, Breeding and Biotechnology* (Wallingford, U.K.: CABI Publishing).
- <sup>38</sup> Martrenchar A, Huonnic D, Cotte JP, Boilletot E, and Morisse JP. 1999. Influence of stocking density on behavioural, health and productivity traits of turkeys in large flocks. *British Poultry Science* 40(3):323-31.
- <sup>39</sup> Wyers M, Cherel Y, and Plassiart G. 1991. Late clinical expression of lameness related to associated osteomyelitis and tibial dyschondroplasia in male breeding turkeys. *Avian Diseases* 35(2):408-14.
- <sup>40</sup> Martrenchar A. 1999. Animal welfare and intensive production of turkey broilers. *World's Poultry Science Journal* 55(2):143-52.
- <sup>41</sup> Smith R. 1991. Cutting edge poultry researchers doing what birds tell them to do. *Feedstuffs*, September 9, p. 22.
- <sup>42</sup> Ekstrand C and Algers B. 1997. Rearing conditions and foot-pad dermatitis in Swedish turkey poults. *Acta-Veterinaria-Scandinavica* 38(2):167-74.
- <sup>43</sup> Ibid.
- <sup>44</sup> Kamyab A. 2001. Enlarged sternal bursa and focal ulcerative dermatitis in male turkeys. *World's Poultry Science Journal* 57:5-12.
- <sup>45</sup> Berg CC. 1998. Foot-pad dermatitis in broilers and turkeys. *Veterinaria* 36(Special):11.
- <sup>46</sup> Li Z, Nestor KE, and Saif YM. 2001. Summary of the effect of selection for increased body weight in turkeys on the immune system. In: Eastridge ML (ed.), *Research and Reviews: Poultry 2001* (Wooster, Ohio: Ohio State University, pp. 21-8).
- <sup>47</sup> Wilson BW, Nieberg PS, and Buhr RJ. 1990. Turkey muscle growth and focal myopathy. *Poultry Science* 59:1553-62.
- <sup>48</sup> Rauw WM, Kanis E, Noordhuizen-Stassen EN, and Grommers FJ, op. cit.
- <sup>49</sup> Leeson S, Diaz G, and Summers JD, op. cit.
- <sup>50</sup> Frank RK, Newman JA, Noll SL, and Ruth GR. 1990. The incidence of perirenal hemorrhage syndrome in six flocks of market turkey toms. *Avian Diseases* 34:824-32.
- <sup>51</sup> Westgren RE. 1999. Delivering food safety, food quality, and sustainable production practices: the Label Rouge poultry system in France. *American Journal of Agricultural Economics* 81(5):1107-11.
- <sup>52</sup> Fanatico A and Born H. 2002. Label Rouge: pasture-based poultry production in France. (Fayetteville, AR:ATTRA—National Sustainable Agriculture Information Service), [attra.ncat.org/attra-pub/labelrouge.html](http://attra.ncat.org/attra-pub/labelrouge.html).
- <sup>53</sup> U.S. Department of Agriculture National Agricultural Statistics Service. 2005. Chickens and eggs: 2004 summary. Published February 2005. [usda.mannlib.cornell.edu/reports/nassr/poultry/pec-bbl/lyegan05.pdf](http://usda.mannlib.cornell.edu/reports/nassr/poultry/pec-bbl/lyegan05.pdf).
- <sup>54</sup> Arshad M. 1999. An ecological study of Red Junglefowl (*Gallus gallus spadiceus*) in agricultural areas. Universiti Putri Malasia.
- <sup>55</sup> United Egg Producers. Industry history. Accessed February 14, 2006. [uepcertified.com/industryhistory.html](http://uepcertified.com/industryhistory.html).
- <sup>56</sup> Webster AB. 2004. Welfare implications of avian osteoporosis. *Poultry Science* 83:184-92.
- <sup>57</sup> Ibid.
- <sup>58</sup> Gregory NG and Wilkins LJ. 1989. Broken bones in domestic fowl: handling and processing damage in end-of-lay battery hens. *British Poultry Science* 30:555-62.

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- <sup>59</sup> Gregory NG, Wilkins LJ, Knowles TG, Sørensen P, and van Niekerk T. 1994. Incidence of bone fractures in European layers. In: Proceedings of the 9th European Poultry Conference, Vol. II (Glasgow, U.K., pp. 126-8).
- <sup>60</sup> Whitehead CC. 2003. Skeletal disorders in laying hens. In: Perry GC (ed.), *Welfare of the Laying Hen* (Cambridge MA: CABI Publishing, pp. 259-78).
- <sup>61</sup> Whitehead CC, Fleming RH, Julian RJ, and Sorenson P. 2003. Skeletal problems associated with selection for increased production. In: Muir WM and Aggrey SE (eds.), *Poultry Genetics, Breeding and Biotechnology* (Wallingford, U.K.: CABI Publishing, pp. 29-52).
- <sup>62</sup> Whitehead CC, Fleming RH, Julian RJ, and Sorenson P, op. cit.
- <sup>63</sup> Whitehead CC and Wilson S. 1992. Characteristics of osteopenia in hens. In: Whitehead CC (ed.), *Bone Biology and Skeletal Disorders in Poultry* (Oxfordshire, U.K.: Carfax, pp. 265-80).
- <sup>64</sup> Rollin BE. 1995. *Farm Animal Welfare: Social, Bioethical, and Research Issues* (Ames, Iowa: Iowa State Press, p. 95).
- <sup>65</sup> U.S. Department of Agriculture Animal and Plant Health Inspection Service. 1996. Dairy 1996 NAHMS Study, p. 21.
- <sup>66</sup> U.S. Department of Agriculture Food Safety and Inspection Service Consumer Education and Information. 2005. *Safety of Veal...from Farm to Table*. Last updated May 2005. [www.fsis.usda.gov/Fact\\_Sheets/Veal\\_from\\_Farm\\_to\\_Table/index.asp](http://www.fsis.usda.gov/Fact_Sheets/Veal_from_Farm_to_Table/index.asp).
- <sup>67</sup> Rollin BE, op cit.
- <sup>68</sup> Davis CL and Drackley JK. 1998. *The Development, Nutrition, and Management of the Young Calf* (Ames, Iowa: Iowa State University Press).
- <sup>69</sup> Animal Welfare Institute. 2006. *Animal Welfare Approved Standards for Beef Cattle and Calves*. [www.awionline.org/farm/standards/beef.htm](http://www.awionline.org/farm/standards/beef.htm).
- <sup>70</sup> Union of Concerned Scientists. 2006. *The Reality of Feed at Animal Factories*. [www.theyeatwhat.com](http://www.theyeatwhat.com).